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ABSTRACT

A causal model was employed to determine the way colleges influence the entry of women into predominately male occupations. The model proposes four main influences on women's attainment of careers in predominately male occupations: (1) initial or pre-enrollment student characteristics; (2) structural or organizational attributes of the college; (3) student performance and experiences during college; and (4) attributes of the employing organization. The model identifies the relative influence of the collegiate experience in relation to precollege and postcollege considerations. Paths by which women attain entry into traditionally male-dominated science and nonscience professions have distinguishing features that are evident in the predictor variables of the model. For example, women's entry into more male-dominated nonscience careers is enhanced by coming from more affluent families, attendance at more selective colleges, and employment in private organizations. Entry into more male-dominated science professions is enhanced by stronger high school and college academic performance, going to public colleges and assuming leadership, and attaining graduate degrees. (SW)

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INFLUENCES ON WOMEN'S ENTRY INTO MALE-DOMINATED OCCUPATIONS

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INFLUENCES ON WOMEN'S ENTRY INTO MALE-DOMINATED OCCUPATIONS

The past two decades have been marked by concerted efforts on the part of women activists for social reforms to guarantee equal educational and occupational opportunities not only for minorities in general, but for women specifically. These reforms were called for in an effort to overcome the sex segregation that has historically typified the American occupational structure and inhibited women's access to higher status and income occupations. The Equal Pay Act of 1963 was the initial landmark legislation prohibiting sex discrimination that resulted from these efforts. This act was soon followed by Title VII of the Civil Rights Act of 1964 and Executive Order 11375 in 1967 prohibiting discrimination in employment. The most far-reaching educational legislation was Title IX of the Education Amendments of 1972 which barred sex discrimination in federally assisted educational programs.

The impact of Title IX and related legislation becomes evident in studies examining women's educational progress. Dearman and Plisko (1980) reported that from 1972 to 1978 women's percentage gain in enrollment in higher education was higher than men at each age level, and in 1979, the number of women entering college exceeded that of men for the first time (50.9% as reported by Pepin, 1980). In addition, Clowes, Hinkle, and Smart (1986) found that the decline in

four-year college enrollment rates from 1961 to 1972 (reported by Peng, 1977) had been reversed by 1982 and could be attributed primarily to the increased enrollment of women.

The percentage of women earning degrees at every level also increased substantially from 1960 to 1979 (Randour, Strasburg, and Lipman-Blumen, 1982). More importantly, while most women were still earning degrees in female-dominated fields of study, significant shifts were seen in the proportions of women earning degrees in such traditionally male-dominated fields as agriculture, business, engineering, computer science, and the physical sciences (National Center for Education Statistics, 1981; Jacobs, 1986). The changes in choice of undergraduate field of study is notable since Bielby (1978) found women's undergraduate major to be connected with subsequent employment in traditionally female occupations.

Thus, the legislation mandating equal educational opportunities for women was vital for without the requisite educational background, women would still be denied entry into the more prestigious occupations customarily held by men. Recent data from the Bureau of the Census (1984) document the success of these legislative events that were enacted in order to increase occupational opportunities for women. For example, in the decade from 1970 to 1980 the representation of women grew from 25% to 38% in accounting,

10% to 27% in business management, 5% to 14% in law, and 9% to 13% in medicine.

As seen in the studies reported above, the progress made by women in the past twenty years in terms of both educational and occupational outcomes has been substantial. However, while there are numerous descriptive studies of the characteristics of women who aspire to enter male-dominated careers (e.g., Sells, 1980; Collins and Matyas, 1985; Lunneborg and Lunneborg, 1985) and correlational studies of pre-college factors associated with this aspiration (e.g., Ellis and Herrman, 1983; Daymont and Andrisani, 1984; Wise, 1985), there is little longitudinal research investigating the roles played by colleges and universities in assisting women's attainment of these occupational aspirations. Randour, Strasburg, and Lipman-Blumen (1982) noted the need for "a longitudinal study ... tracking a large, representative group of women from entry into higher education through occupational entry, to five to ten year post-entry levels" in order "to understand better how various institutional factors affect educational and occupational outcomes for women" (p. 200). It seems quite plausible, as Daniels (1975) suggested, that some college environments may be more suitable than others in enhancing women's interest in and entry into male-dominated occupations. The identification of supportive collegiate environments could suggest ways in which to reduce the attrition noted by Berryman (1985) be-

tween women's initial aspirations and subsequent attainment of careers in traditionally male-dominated occupations.

The central purpose of this study was to examine the manner by which colleges and universities influence the entry of women into predominately male occupations. A singular emphasis upon colleges and universities, however, would be inappropriate because of existing findings demonstrating that this phenemenon is also associated with various precollege attributes of women (e.g., Lunneborg and Lunneborg, 1985; Wise, 1985) and numerous findings that patterns of occupational behavior may vary according to different types of careers (Moore, 1985; Tinto, 1980) and employing organizations (Rumberger, 1981; Smart and Ethington, 1986). Thus, the study proposes a causal model incorporating four primary sources of influence on women's attainment of careers in predominantly male-dominated occupations: (1) initial or pre-enrollment student characteristics, (2) structural or organizational attributes of the college or university, (3) student performance and experiences in those institutions, and (4) attributes of the employing organization. The estimation of the model allows the determination of the relative influence of measures in the four sets of variables on women's entry into male-dominated occupations and thus permits identification of the relative influence of the collegiate experience in relation to precollege and postcollege considerations.

Proposed Causal Model

The model proposed in this study draws upon the components of models of occupational status attainment (e.g., Blau and Duncan, 1967; Sewell and Hauser, 1975) and models of the longitudinal influence of colleges and universities (e.g., Astin, 1970; Chickering, 1969; Weidman, 1984). Common among these models are sources of influence from individuals' backgrounds (e.g., social origins and social-psychological states) and from their experiences and achievements in various environments (e.g., schools, colleges, and work settings).

The model estimated in this study is a block-recursive model in which students' background measures (parental socioeconomic status, academic self-concept, high school academic achievement, and initial occupational aspirations) were considered the exogenous variables. These background measures were expected to influence the type of undergraduate institution in which the students enrolled in 1971. The characteristics of the undergraduate institution (selectivity, size, control) are then seen as the first block of endogenous variables. These two sets of variables were subsequently expected to influence the nature of the students' collegiate experiences. The undergraduate experience was reflected in measures of academic performance, career preparation, leadership within the institution, and the relationship of undergraduate major to subsequent career choice. The

final block of variables in the model contained measures representing the highest academic degree attained and characteristics of the workplace (size and type). Each of these variables was considered to be a function of all causally antecedent variables in the model.

The dependent variable in the model was currect occupation measured as percent of males in the field (Bureau of the Census, 1973), and was seen to be causally dependent on all preceding variables. Of primary interest in the estimation of the model was the determination of the effects of the variables associated with the post-secondary educational experience. Those variables exhibiting significant effects, either direct or indirect, would identify institutional factors or the experiences of women within those institutions that enhanced their entry into male-dominated fields. The manner in which these effects were manifested would reflect the dynamics of the percentage shifts in male-dominated occupations that could be attributed to the educational institutions.

Methodology

Data and Sample

Data for this study were drawn from the Cooperative Institutional Research Program (CIRP) surveys (see Astin, 1982). This longitudinal study was designed to produce data on a wide range of cognitive and affective student outcomes of the collegiate experience. Respondents were initially

surveyed as entering college freshmen in 1971, obtaining a broad array of information on students' family backgrounds, high school experiences, initial occupational aspirations, and personal characteristics. In 1980, the same respondents completed a follow-up instrument on their actual collegiate experiences and their educational and occupational achievements in the intervening nine-year period. Characteristics of the undergraduate institution were available from the Higher Education General Information Survey (HEGIS) files included on the CIRP tape. These data were particularly appropriate for this study in that the women in this sample were students during the period in which the reform efforts for educational and occupational equality for women were beginning to have an impact. Thus, the role of the postsecondary institutions in the realization of these efforts could be examined.

Studies examining career attainment processes (e.g., Smart, 1986; Tinto, 1980) have suggested that the influences of colleges and universities differ between the professional and nonprofessional segments of the labor market. In particular, the cognitive attributes of the institutions and students' academic performance within those institutions are more highly related to career attainments for professional occupations. Additionally, while not all professional and managerial jobs are male-dominated, the higher status and income occupations that have traditionally been held by men

are found in these areas. For these reasons, the present analyses were restricted to the 2,117 women who were employed full-time in a professional or managerial position in 1980 and who had complete data on the variables used in the estimation of the model and whose operational definitions are given in Table 1.

Insert Table 1 about here

Analyses

The extant literature includes several studies which have identified differences between women aspiring to technical or scientific careers and those aspiring to less quantitatively oriented occupations (e.g., Berryman, 1985; Ethington, 1986; Ware, Steckler, and Leserman, 1985). Results of those studies suggested that the effects of some of the variables included in the model may differ for these two groups of women. This possibility was examined by creating a variable representing the nature of the 1980 occupation (science vs. non-science) and computing the interaction between this variable and each variable hypothesized to influence current occupation. These interaction terms were subsequently added to the regression of current occupation on all causally antecedent variables. The R^2 increase was found to be statistically significant, indicating differences between women in science and non-science related occupations

in terms of the importance of some variables in the model. The sample was then separated into two groups, science (n = 415) and non-science (n = 1,702), and the model estimated separately for each.

The causal effects implied in the proposed model were estimated with ordinary least squares regression procedures. Three types of effects are forthcoming; direct, indirect, and total. These effects may be expressed in standardized or metric units. The direct causal effects are represented by regression coefficients, either standardized (beta weights) or unstandardized (b weights). The indirect causal effects are estimated by the sums of the products of direct effects through intervening variables in the model. The total causal effects of the independent variables on the criterion are simply the sums of the direct and indirect effects.

The effects implied by the model described above were estimated using GEMINI (Wolfle and Ethington, 1985), a FORTRAN program based on the work of Sobel (1982) that computes indirect effects and their standard errors in addition to the usual regression results. The significance of the total effects was determined by the estimation of the reduced form equations. All analyses were conducted using the means, standard deviations, and correlations given in Table 2.

Insert Table 2 about here

Results

The estimated coefficients of each of the eleven structural equations defining the causal model are given in both standardized and metric form in Tables 3 and 4 for the science and non-science groups, respectively. Equation 15 in each table shows the direct effects of each variable in the model on percent male-domination of current occupation. The fourteen variable model explains 58.53% of the variance in the criterion for women in science-related occupations and 54.74% for women in non-science fields. Because there were more than four times as many women in the non-science areas as in science, alpha was set at .01 for the non-science group but only .05 for the science group.

Insert Tables 3 and 4 about here

Direct Effects

Three variables in the model exert significant direct effects on the entry of women into male-dominated science and nonscience occupations. Organizational type has the largest direct effect for women in nonscience occupations and the second largest direct effect for those in science careers. The negative effect of this variable in both equations indicates that women working in private organizations are more likely to be in occupations with a higher percentage of males than those working in public organizations. Initial occupa-

tional aspirations has a significant, positive direct effect for both groups of women and is the only background characteristic having a non-zero direct influence on entry into male-dominated occupations. While significant for both groups, initial aspirations are almost three times more important for women in scientific fields. The degree to which the undergraduate major is related to the current job has a significant, negative direct effect for both groups, indicating that women in predominantly male-dominated science and nonscience occupations are more apt to perceive their undergraduate major as unrelated to the work in which they are currently involved.

Additional direct effects are seen that are unique for women in science and non-science careers. Institutional control (public/private) has a significant, negative direct effect only for women in science fields, indicating that those in science occupations with larger percentages of men are more likely to have attended public institutions. Positive direct effects are seen from highest degree attained and from involvement in leadership activities within the undergraduate institution only for women employed in science occupations, while the selectivity of the undergraduate institution and the size of the employing organization have positive direct effects only for women working in nonscience careers.

Further examination of Tables 3 and 4 reveals differences between the two groups of women in the patterns of direct effects on the intervening variables in the model. For example, socioeconomic background and the characteristics of the undergraduate institution appear to be more influential for the nonscience group, evidenced by the greater number of significant direct effects on intervening factors. In contrast, measures associated with the undergraduate experience are more influential for the science group where each of the variables has significant effects on subsequent endogenous variables. In fact, three of the four variables have strong effects on highest degree attained, which in turn exerts strong effects on entry into male-dominated science occupations.

Indirect and Total Effects

Table 5 presents a summary of the direct effects of the independent variables in the model on the criterion as well as the indirect and total effects of these variables. Initial occupational aspirations and the degree to which the undergraduate major is related to current occupation have strong indirect effects on entry into male-dominated occupations for both groups of women. The indirect effects of initial aspirations are mediated primarily through the selectivity of the undergraduate institution, relatedness of undergraduate major to current job, and type of organization. Highest degree attained was also a mediating variable for

women in science-related occupations. The type of employing organization was the primary mediating variable for the effects of relatedness of undergraduate major. Additional indirect effects are seen from selectivity of the institution and socioeconomic background for women in non-scientific occupations, and from both high school and college academic performance for the women in science-related occupations.

Insert Table 5 about here

In scientific fields, the strong direct and indirect effects of initial aspiration results in this variable having the greatest influence on subsequent entry into predominately male occupations. In contrast, for women in non-scientific fields, the type of employing organization has the greatest impact on entry into male-dominated occupations, followed by relatedness of the undergraduate major and initial occupational aspiration. Additional differences are seen between the two groups of women in terms of the types of variables having significant total effects on the criterion. While initial aspirations and type of employing organization are the two most influential variables for women in scientific careers, the additional significant total effects come from measures associated with the educational experience (e.g., high school grades, involvement in college leadership activities, highest degree attained). The opposite is true for

the women in non-scientific careers where the majority of the measures having significant total effects come from outside the educational institution (e.g., socioeconomic background, size of employing organization).

Discussion

The results of this study clearly suggest that subsequent research on women's entry into traditionally male-dominated occupations should distinguish between those who aspire to careers in science versus non-science professions. This is evident from initial analyses of cross-product terms that show a significant improvement from the use of separate analyses and from the specific results obtained from the separate analyses. In sum, the paths by which women attain entry into traditionally male-dominated science and non-science professions have many distinguishing features, and these features are evident in each of the four sets of predictor variables included in the model. For example, women's entry into more male-dominated <u>non-science</u> careers tends to be enhanced by coming from more affluent families, attendance at more selective undergraduate institutions, and employment in private organizations; while entry into more male-dominated <u>science</u> professions is enhanced by stronger high school and undergraduate academic performance, attendance at public colleges and universities, involvement in leadership activities at those institutions, and subsequent acquisition of graduate degrees. These differences suggest that the sub-

sequent entry of women into more highly male-dominated science professions is more strongly related to the kind of undergraduate institution they attend and their undergraduate experiences than is true for their peers entering non-science professions where the majority of the distinctive measures having significant total effects come from outside the educational institution.

Nonetheless, there are several common features in the model regarding women's entry into male-dominated science and non-science professions. For both groups, initial occupational aspiration, relatedness of the undergraduate major to the current job, and the type of organization in which they are employed exert significant total effects. These three measures further emphasize the need for longitudinal studies since they cut across the precollege, undergraduate, and postcollege dimensions of the model. Women's entry into more highly male-dominated science and nonscience professions appears to be enhanced by such aspirations prior to their undergraduate experience, majoring in fields that are <u>less related</u> to their current jobs and employment in private organizations. The former finding is easily understood since precollege aspirations have often been demonstrated to be strong predictors of postcollege occupational attainments (e.g., Smart, 1986; Tinto, 1980). While an important influence for both groups, the total effect of initial aspirations is more than twice as strong for women's entry into more

male-dominated science-related occupations. This probably reflects the need for a strong quantitative background for entry into these careers. Women initially aspiring to a scientific occupation would be more likely to enroll in advanced mathematics and science courses (regardless of their specific major), and while the current occupation may be unrelated to the specific undergraduate major (see below), the type of background and training received in these courses may be very important to the particular occupation.

The latter findings are less expected and deserving of further elaboration and study. Recent reports from the National Center for Education Statistics (1984) indicate that over 40 percent of college graduates do not find a close relationship between their fields of undergraduate training and their current jobs. While the relationship between these measures is thus tenuous at best, it is surprising that their relationship is strongly negative in this particular instance. One possible explanation for this situation is that employing organizations may be more lenient in their customary hiring policies in an effort to attract women into professions traditionally dominated by men in order to comply with legislative and executive mandates (e.g., Title VII of the Civil Rights Act of 1964; Executive Order 11375 in 1967). This possibility clearly has implications for reducing occupational sex segregation, but raises other questions about the career consequences for women who enter male-dominated

careers without adequate preparation/credentials (e.g., professional advancement, job satisfaction). Recent findings by Smart, Elton, and McLaughlin (1986) show that people with a higher level of relatedness between their undergraduate major and jobs have higher levels of job satisfaction. This suggests that women who gain entry into professional careers initially without adequate educational preparation may encounter a less rewarding work environment in years ahead. Kanter (1977), Wise (1985), and others have noted, as well, that inadequate educational preparation has been a major limitation to the career progress of women in traditionally male-dominated careers (math for science; finance for business). Thus, the potential leniency of employing organizations initially may result in subsequent problems for women in these atypical careers.

It is equally curious that employment in private organizations has a strong positive relationship to the probability of women's entry into male-dominated <u>science and nonscience</u> professional careers. This possibility may suggest that private organizations have made a stronger effort to attract women into such career fields than organizations in the public sector. Again, however, it is necessary to monitor the career consequences for women employed in atypical career fields in public versus private organizations, for recent findings by Smart and Ethington (1986) suggest that women employed in either male- or female-dominated careers

in private organizations have lower levels of intrinsic, extrinsic, and overall job satisfaction than those in sex-balanced career fields. They did not find a similar relationship between the level of occupational sex segregation and job satisfaction for women in public organizations. Thus, while the possibility of employment in private organizations may enhance women's initial entry into male-dominated careers, the longer term career consequences may be less attractive.

The scarcity of longitudinal studies of the factors associated with women's entry into traditionally male-dominated professions has been noted previously (e.g., Randour, Strasburg, and Lipman-Blumen, 1982) and their need is abundantly clear from the preceding results. This phenomenon results from a complex interaction of the personal characteristics of women at the time they begin their undergraduate education, the characteristics of the institutions they attend, their experiences within those institutions, and their educational and employment activities following completion of their undergraduate preparation. Indeed, efforts to determine the contribution of colleges and universities to women's attainment in this domain would be incomplete without consideration of these multiple sources of influence.

The finding that women's entry into both science and non-science careers that have been traditionally dominated by men is negatively influenced by the relatedness of their

undergraduate majors to their current jobs presents an unusual dilemma for college and university officials. While recent research has shown that their institutions have been successful in assisting women to major in traditionally male-dominated fields of study (Astin, 1977; Jacobs, 1986), these efforts seem counterproductive to women's subsequent entry into traditionally male-dominated science and non-science occupations. This, perhaps more than anything else, documents the interrelationship between sets of variables in the model. One consequence of this finding is that college and university officials must work actively with their counterparts in employing organizations to discern the underlying causes of this curious phenomenon if their efforts to provide undergraduate preparation in appropriate fields of study are to make a positive contribution to women's successful entry into and performance in traditionally male-dominated science and non-science occupations.

There is reason to believe that college and university officials have a greater potential to assist women's entry into science, as opposed to non-science, male-dominated occupations given the results of this study. Other than their attendance at more selective undergraduate institutions (and the negative relationship between their field of study and current job noted above), women's entry into male-dominated non-science careers seems uninfluenced by measures of the collegiate experience included in the model used in this

study. On the other hand, women's entry into traditionally male-dominated science occupations is directly influenced by their participation in leadership activities and their subsequent attainment of a graduate degree (see Table 3) and indirectly influenced by their undergraduate academic achievement (see Table 5). These finding suggest that efforts by college and university officials to promote women's participation in undergraduate leadership activities, to assist their efforts for successful undergraduate academic performance, and to encourage their aspirations for graduate study are likely to have a positive influence on their subsequent entry into traditionally male-dominated science occupations.

Reference List

Astin, A. W. (1970). The methodology of research on college impact. Sociology of Education, 43, 223-254.

Astin, A. W. (1977). Four critical years. San Francisco: Jossey-Bass.

Astin, A. W. (1982). Minorities in American higher education. San Francisco: Jossey-Bass.

Berryman, S. E. (1985). Minorities and women in mathematics and science: Who chooses these fields and why? Paper presented at American Association for the Advancement of Science, Los Angeles, May.

Bielby, D. D. V. (1978). Career sex-atypicality and career involvement of college education women: Baseline evidence from the 1960s. Sociology of Education, 51, 7-28.

Blau, P. M., & Duncan, O. D. (1967). The American occupational structure. New York: Wiley.

Bureau of the Census (1973). Occupational characteristics. Washington D. C.: U. S. Department of Commerce.

Bureau of the Census (1984). Detailed occupation of the experienced civilian labor force by sex for the United States and regions: 1980 and 1970. Washington D. C.: U. S. Department of Commerce.

Chickering, A. W. (1969). Education and identity. San Francisco: Jossey-Bass.

Clowes, D. A., Hinkle, D. E., & Smart, J. C. (1986). Enrollment patterns in postsecondary education: 1961-1982. The Journal of Higher Education, 57, 121-133.

Collins, M. and Matyas, M. L. (1985). Minority women: Conquering both sexism and racism. In J. B. Kahle (ed.), Women in science. London: Falmer Press.

Daniels, A. K. (1975). Feminist perspectives in sociological research. In M. Millman & R. M. Kanter (Eds.), Another voice. Garden City, New York: Anchor Books.

Daymont, T. N. and Andrisani, P. J. (1984). Job preferences, college major, and the gender gap in earnings. Journal of Human Resources, 19, 408-428.

Dearman, N. B., & Plisko, V. W. (1980). The condition of education. Washington, D. C.: National Center for Education Statistics.

Ellis, R. A. and Herrman, (1983). Three dimensions of occupational choice: A research note on measuring the career intentions of women. Social Forces, 61, 893-903.

Ethington, C. A. (1986). SAT-M performance of women intending quantitative fields of study. Paper accepted for presentation at American Educational Research Association, Washington, April, 1987.

Goldman, R. D., & Hewitt, B. N. (1976). The Scholastic Aptitude Test 'explains' why college men major in science more often than college women. Journal of Counseling Psychology, 23, 50-54.

Jacobs, J. A. (1986). The sex-segregation of fields of study: Trends during the college years. The Journal of Higher Education, 57, 134-154.

Kanter, R. M. (1977). Men and women of the corporation. New York: Basic Books.

Lunneborg, P. W., & Lunneborg, C. E. (1985). Nontraditional and traditional female college graduates: What separates them from the men? Journal of College Student Personnel, 26, 33-36.

Moore, H. A. (1985). Job satisfaction and women's spheres of work. Sex Roles, 13, 663-678.

National Center for Education Statistics (1981). Digest of educational statistics 1981. Washington, D. C.: U. S. Government Printing Office.

National Center for Education Statistics (1982). Digest of educational statistics 1982. Washington, D. C.: U. S. Government Printing Office.

National Center for Education Statistics (1984). Digest of educational statistics 1983-84. Washington, D. C.: U. S. Government Printing Office.

Peng, S. S. (1977). Transfer students among institutions of higher education. Washington, D. C.: U. S. Government Printing Office (Document number NCES 77-250).

Pepin, A. J. (1980). Fall enrollment in higher education, 1979. Washington, D. C.: National Center for Education Statistics.

Randour, M. L., Strasburg, G. L., & Lipman-Blumen, J. (1982). Women in higher education: Trends in enrollment and degrees earned. Harvard Educational Review, 52, 189-202.

Rumberger, R. W. (1981). Overeducation in the U.S. labor market. New York: Praeger.

Sells, L. W. (1980). The mathematics filter and the education of women and minorities. In L. H. Fox, L. Brody, & D. Tobin (Eds.). Women and the mathematical mystique. Baltimore: Johns Hopkins University Press.

Sewell, W. H., & Hauser, R. M. (1975). Education, occupation, and earnings. New York: Academic Press.

Smart, J. C. (1986). College effects on occupational status attainment. Research in Higher Education, 24, 73-95.

Smart, J. C., Elton, C. F., and McLaughlin, G. W. (1986). Person-environment congruence and job satisfaction. Journal of Vocational Behavior, 29, 216-225.

Smart, J. C., & Ethington, C. A. (in press). Occupational sex segregation and job satisfaction of women. Research in Higher Education.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. In S. Leinhardt (Ed.), Sociological methodology 1982. San Francisco: Jossey-Bass.

Tinto, V. (1980). College origins and patterns of status attainment. Sociology of Work and Occupations, 7, 457-486.

Ware, N. C., Steckler, N. A., & Leserman, J. (1985). Undergraduate women: Who chooses a science major? Journal of Higher Education, 56, 73-84.

Weidman, J. C. (1984). Impacts of campus experiences and parental socialization on undergraduates' career choices. Research in Higher Education, 20, 445-476.

Wise, L. L. (1985). Project TALENT: Mathematics course participation in the 1960s and its career consequences. In S. F. Chapman, L. R. Brush, and D. M. Wilson (eds.), Women and mathematics: Balancing the equation. London: Lawrence Erlbaum Associates.

Wolfle, L. M., & Ethington, C. A. (1985). GEMINI: Program for analysis of structural equations with standard errors of indirect effects. Behavior Research Methods, Instruments, & Computers, 17, 581-584.

Table 1

Operational Definitions of Variables Included in the Model of Women's Entry into Male-dominated Occupations

Variables	Definitions
Precollege Characteristics	
1. Socioeconomic status	A scale created by summing after standardizing the three items measuring father's education, mother's education, and combined parental income. There were six educational levels (from "grammar school or less" to "post-graduate degree") and twelve income levels (from "less than $4,000" to "$40,000 or more"). (alpha reliability = 0.77)
2. Academic self-concept	A scale created by summing after standardizing respondents' self-ratings of their academic ability, mathematical ability, and intellectual self-confidence; their estimate of the likelihood that they would graduate with honors, be elected to an academic honor society, make at least a B average, and enroll in honors courses; and their high school rank. The response scales were: self-ratings (five levels from "lowest 10%" to "highest 10%"), likelihood items (four levels from "no chance" to "very good chance"), and high school rank (four levels from "fourth quarter" to "top quarter"). (alpha reliability = 0.84)
3. High school grades	A single item measuring respondents' self-reported average high school grades. There were eight levels from "D" to "A or A+."
4. Occupational aspiration	This variable measured the percent male-domination of respondents' occupational aspirations as college freshmen. Each occupational category was assigned a value according to the 1970 Bureau of the Census reports of percentage of males in each category.
Institutional Characteristics	
5. Selectivity	A scale created by summing after standardizing the mean SAT (or ACT equivalent) score of the undergraduate student body divided by ten; per pupil expenditures (eight levels from "less than $1,000" to "$4000 or more"); and tuition (nine levels from "less than $250" to "$3,500 or more"). (alpha reliability = 0.78)
6. Size	A scale computed by summing after standardizing the total enrollment of the institution (nine levels from "less than 250" to "20,000 or more"); percent graduate student enrollment (nine levels from "0%" to "41% or more"); and student-to-faculty ratio (nine levels from "less than 10:1" to "more than 30:1"). (alpha reliability = 0.77)

Table 1 (continued)

Variables	Definitions
7. Control	A dichotomous variable coded (1) public institution and (2) private institution.
Collegiate Experiences	
8. Related	A measure of the extent to which the respondent's current job was related to undergraduate major with three response categories ranging from "not related" to "closely related."
9. Leadership	This variable was created by counting the number of leadership activities the respondent was involved in while in college. The activities were "knowing a professor or administrator personally", "president of one or more student organizations", and "serving on a university or departmental committee." Values ranged from 0 to 3.
10. Preparation	A single item assessing the degree to which respondents believed that their college education prepared them for their current job. There were four response categories ranging from "not well" to "very well."
11. College grades	A single item measuring respondents' self-reported ave-age undergraduate grades. There were six levels ranging form "D or less" to "A - or more."
Degree Attainment	
12. Highest degree	A single item measuring highest degree currently held. It was recoded such that (1) less than bachelor's, (2) bachelor's, (3) master's, and (4) doctorate or advanced professional.
Organizational Characteristics	
13. Organizational type	A dichotomous variable created by recoding the item indicating the type of employing organization such that (1) private and (2) public.
14. Organizational size	A measure indicating the number of people employed in the organization with seven levels ranging from "work alone" to "25,000 or more."
Occupational Choice	
15. Current Occupation	This variable measured the percent male-domination of respondent's current occupation. It was coded the same as occupational aspiration.

Table 2. Correlations, Means, and Standard Deviations for Variables*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sex	-	.136	.091	.128	.381	-.044	.250	-.146	.135	-.043	.097	.170	-.135	-.013	.181
Academic Self-concept	.310	-	.600	.204	.240	.028	.105	-.049	.128	.076	.341	.161	-.069	.024	.118
H.S. Grades	.210	.622	-	.139	.282	.056	.107	-.011	.082	.072	.431	.191	-.015	.020	.062
Occupational Aspirations	.267	.408	.304	-	.257	.037	.097	-.186	.085	-.094	.043	.037	-.177	.065	.285
Selectivity	.458	.359	.420	.346	-	-.129	.524	-.215	.115	-.014	.126	.242	-.164	.056	.239
Size	-.011	.048	.008	.140	.007	-	-.478	-.007	-.107	-.070	-.048	.038	-.014	.086	.038
Control	.243	.238	.262	.073	.525	-.489	-	-.100	.178	.034	.111	.151	-.052	.018	.070
Related	-.037	-.061	-.100	-.148	-.145	-.023	-.081	-	.015	.455	.067	.089	.465	-.092	-.533
Leadership	.168	.239	.197	.144	.189	-.097	.242	-.046	-	.122	.085	.163	.006	.004	.052
College Preparation	.000	-.002	-.057	-.036	.030	-.085	.118	.404	.150	-	.081	.116	.238	-.038	-.237
College Grades	.252	.418	.490	.162	.198	-.088	.178	-.017	.225	.110	-	.154	.041	-.004	-.028
Highest Degree	.313	.382	.362	.362	.417	.054	.241	-.087	.319	.141	.323	-	.215	.078	-.089
Organizational Type	-.037	-.091	-.094	-.310	-.061	-.140	.082	.257	.031	.160	-.047	.055	-	-.100	-.671
Organizational Size	.033	.018	.061	.129	.070	.077	-.009	-.142	.108	.006	.051	.028	-.185	-	.167
Current Occupation	.214	.339	.330	.603	.310	.097	.062	-.340	.212	-.095	.226	.429	-.481	.146	-
Science															
Mean	.035	1.369	6.039	43.275	.408	.124	1.641	2.489	1.053	2.814	4.896	2.159	1.720	4.636	47.002
SD	2.453	5.443	1.513	32.963	2.572	2.644	.480	.748	.891	.956	.920	.828	.449	1.253	38.872
Nonscience															
Mean	.078	.159	5.650	45.971	.010	-.043	1.645	2.307	1.193	2.681	4.904	2.178	1.705	4.409	52.266
SD	2.444	5.167	1.451	24.068	2.346	2.438	.479	.827	.845	.964	.815	.624	.456	1.328	29.106

*Correlations below the diagonal are for women in science-related occupations (N = 415).
Correlations above the diagonal are for women in nonscience-related occupations (N = 1702).

TABLE 3
Structural Parameter Estimates for Women in Science-Related Male-Dominated Occupations[a]

Variables	Dependent Variables										
	5	6	7	8	9	10	11	12	13	14	15
1. Socioeconomic status	.352* (.369)	-.052 (-.056)	.195* (.038)	.044 (.014)	.068 (.025)	-.022 (-.008)	.166* (.062)	.081 (.027)	.019 (.003)	-.005 (-.002)	-.009 (-.148)
2. Academic self-concept	-.001 (-.001)	.029 (.014)	.091 (.008)	.058 (.008)	.134** (.022)	.055 (.010)	.166* (.028)	.074 (.011)	.034 (.003)	-.099 (-.023)	.004 (.025)
3. High school grades	.297* (.505)	-.046 (-.081)	.186* (.059)	-.055 (-.027)	.046 (.027)	-.116 (-.071)	.402* (.244)	.073 (.040)	-.022 (-.007)	.045 (.038)	.080 (1.552)
4. Occupational aspiration	.162* (.013)	.158* (.013)	-.072 (-.001)	-.126** (-.003)	.054 (.001)	-.027 (-.001)	-.026 (-.001)	.165* (.004)	-.296* (-.004)	.105 (.004)	.345* (.407)
5. Selectivity				-.094 (-.027)	-.022 (-.007)	.013 (.005)	-.098 (-.035)	.177* (.057)	.026 (.004)	.021 (.010)	.051 (.775)
6. Size				-.030 (-.009)	-.024 (-.008)	-.023 (-.008)	-.093 (-.032)	.081 (.025)	-.081 (-.010)	.065 (.031)	-.060 (-.878)
7. Control				-.048 (-.075)	.177* (.328)	.124 (.247)	.001 (.002)	.036 (.063)	.059 (.055)	-.031 (-.080)	-.107** (-8.634)
8. Related								-.062 (-.069)	.202* (.121)	-.146* (-.245)	-.174* (-9.019)
9. Leadership								.165* (.153)	.053 (.027)	.095 (.134)	.075** (3.278)
10. Preparation								.136* (.117)	.051 (.024)	.062 (.081)	-.000 (-.019)
11. College grades								.122** (.109)	-.042 (-.021)	.030 (.041)	.025 (1.050)
12. Highest degree											.263* (12.335)
13. Organizational type											-.337* (-29.151)
14. Organizational size											-.006 (-.198)
15. Current occupation											
R^2	.342	.024	.112	.037	.102	.024	.293	.343	.166	.054	.585

[a]Metric coefficients are given in parentheses.
*$p<.01$; **$p<.05$

TABLE 4
Structural Parameter Estimates for Women in Nonscience-Related Male-Dominated Occupations[a]

Variables	Dependent Variables										
	5	6	7	8	9	10	11	12	13	14	15
1. Socioeconomic status	.335* (.321)	-.053 (-.053)	.234* (.046)	-.068* (-.023)	.092* (.032)	-.045 (-.018)	.056 (.019)	.083* (.021)	-.051 (-.010)	-.052 (-.028)	.015 (.182)
2. Academic self-concept	.035 (.016)	-.010 (-.005)	.024 (.002)	-.013 (-.002)	.096* (.016)	.078 (.015)	.129* (.020)	.028 (.003)	-.047 (-.004)	.005 (.001)	.028 (.144)
3. High School grades	.206* (.332)	.061 (.103)	.064 (.021)	.073 (.042)	.007 (.004)	.052 (.034)	.366* (.205)	.069 (.030)	.032 (.010)	-.007 (-.007)	.003 (.050)
4. Occupational aspiration	.179* (.017)	.037 (.004)	.053 (.001)	-.139* (-.005)	.051 (.002)	-.105* (-.004)	-.030 (-.001)	-.031 (-.001)	-.076* (-.001)	.039 (.002)	.117* (.141)
5. Selectivity				-.175* (-.062)	-.035 (-.013)	-.023 (-.009)	-.055 (-.019)	.176* (.047)	-.057 (-.011)	.035 (.020)	.070* (.866)
6. Size				-.031 (-.010)	-.047 (-.016)	-.066 (-.026)	-.051 (-.017)	.112* (.029)	.005 (.001)	.114* (.062)	.009 (.107)
7. Control				.001 (.002)	.135* (.239)	.022 (.044)	.052 (.089)	.067 (.087)	.038 (.036)	.054 (.151)	-.042* (-2.558)
8. Related								.116* (.087)	.414* (.229)	-.081* (-.130)	-.257* (-9.043)
9. Leadership								.112* (.083)	.011 (.006)	.006 (.010)	.041 (1.428)
10. Preparation								.046 (.030)	.036 (.117)	.006 (.008)	.012 (.376)
11. College grades								.062 (.048)	.022 (.013)	.000 (.000)	-.018 (-.570)
12. Highest degree											.010 (.469)
13. Organizational type											-.515* (-32.828)
14. Occupational size											.080* (1.751)
15. Current occupation											
R^2	.240	.007	.073	.074	.055	.027	.207	.131	.233	.023	.547

[a]Metric coefficients are given in parentheses.
*$p < .01$

Table 5. Direct, Indirect, and Total Effects of Independent Variables[a]

	Science			Nonscience		
Variables	Direct	Indirect	Total	Direct	Indirect	Total
Socioeconomic status	-.009 (-.148)	.043 (.684)	.034 (.536)	.015 (.182)	.106* (1.265)	.121* (1.447)
Academic self-concept	.004 (.025)	.012 (.083)	.016 (.108)	.026 (.144)	.036 (.201)	.062 (.345)
High School grades	.060 (1.552)	.087** (2.244)	.147* (3.796)	.003 (.050)	-.024 (-.483)	-.021 (-.432)
Occupational aspiration	.345* (.407)	.198* (.233)	.543* (.640)	.117* (.141)	.143* (.173)	.260* (.314)
Selectivity	.051 (.775)	.053 (.801)	.104 (1.576)	.070* (.866)	.118* (1.458)	.188* (2.324)
Size	-.060 (-.878)	.040 (.582)	-.020 (-.296)	.009 (.107)	.022 (.264)	.031 (.371)
Control	-.107** (-8.634)	.022 (1.789)	-.085 (-6.845)	-.042 (-2.558)	-.012 (-.709)	-.054 (-3.267)
Related	-.174* (-9.019)	-.084* (-4.343)	-.258* (-13.362)	-.257* (-9.043)	-.219* (-7.689)	-.476* (-16.732)
Leadership	.075** (3.278)	.025 (1.087)	.100** (4.365)	.042 (1.428)	-.004 (-.132)	.038 (1.296)
Preparation	-.000 (-.019)	.018 (.740)	.018 (.721)	.012 (.376)	-.018 (-.538)	-.006 (-.162)
College grades	.025 (1.050)	.046** (1.941)	.071 (2.991)	-.016 (-.570)	-.011 (-.390)	-.027 (-.960)
Highest degree	.263* (12.335)		.263* (12.335)	.010 (.469)		.010 (.469)
Organizational type	-.337* (-29.151)		-.337* (-29.151)	-.515* (-32.828)		-.515* (-32.828)
Organizational size	-.006 (-.196)		-.006 (-.196)	.080* (1.751)		.080* (1.751)

[a]Metric effects are given in parentheses.

*$p < .01$; **$p < .05$